

WE CLAIM:

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1. A process for producing alkyl esters useful in biofuels and lubricants by reacting glyceride- or free fatty acid- containing substances in a critical fluid medium, said process comprising the steps of:

- (a) dissolving the glyceride- or free acid- containing substance and an alcohol or water input into a critical fluid; and
- (b) reacting the glyceride- or free fatty acid- containing substance with an alcohol or water in the presence of a catalyst to produce final products.

10 2. A process as described in claim 1 wherein said alcohol is an ROH input, wherein R is a short chain alkyl group.

15 3. A process as described in claim 2 where said alcohol is chosen from among the group ethanol, methanol, propanol, butanol, isopropanol and isobutanol.

4. A process as described in claim 1 wherein said catalyst is a liquid catalyst.

5. A process as described in claim 1 wherein said catalyst is a solid catalyst.

20 6. A process as described in claim 4 wherein said liquid catalyst is an acid.

7. A process as described in claim 4 wherein said liquid catalyst is a base.

25 8. A process as described in claim 5 wherein said solid catalyst is an inorganic oxide.

9. A process as described in claim 8 wherein said inorganic oxide is from among the group of alumina, silica, silica-alumina, boria, oxides of phosphorus, titanium dioxide, zirconium dioxide, chromia, zinc oxide, magnesia, ion exchange resins, silicate

catalysts, and calcium oxide either unmodified or modified with chlorine, fluorine, sulfur or an acid or base.

5 10. A process as described in claim 5 wherein said solid catalyst is an ion exchange resin with either acidic or basic properties.

11. A process as described in claim 1 wherein said process further comprises the steps of:

- 10 (a) separating a glycerol product from said final products; and  
(b) separating an alkyl ester product from said critical fluid.

12. A process as described in claim 11 wherein said process further comprises the step of recycling said critical fluid for use in a later reaction.

15 13. A process for producing alkyl esters useful in biofuels and lubricants by reacting a glyceride- containing substance in a critical fluid medium, said process comprising the steps of:

- 20 (a) dissolving a glyceride- containing substance and an alcohol or water input into a critical fluid; and  
(b) reacting the glyceride- containing substance and alcohol or water input in a reactor in the presence of a catalyst to produce final products; and  
(c) separating an alkyl ester product and a glycerol product from the reaction mixture.

25 14. A process as described in claim 13 additionally comprising the step of recycling said critical fluid for reuse in this process.

15. A process for reacting fatty acids in a critical fluid medium, said process comprising the steps of:

(a) dissolving a fatty acid- containing substance and an alcohol input fluid; and

(b) reacting the fatty acid- containing substance and an alcohol or a reactor in the presence of a catalyst to produce final products; and

(c) separating an alcohol ester product and a glycerol product from mixture.

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